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till they were seven years old, when both laid eggs and have done so now for three years. They lay two eggs each upon the naked ground without the least appearance of a nest, and far away from the water. Last spring I procured a young male (as I suppose), but no two of the three ever associate together, as far as observed. One of the females sat about ten days upon her eggs last spring and then gave it up. The crows dined on the eggs of the others.

I hope in the future to write more fully my observations on the mountain sheep and the Hawaiian geese, both of which are interesting subjects of study and are not very thoroughly understood. Very truly yours,

J. D. CATON.

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## THE CRITICS OF EVOLUTION.

BY J. S. LIPPINCOTT.

[*Continued.*]

*Opposition of Dawson.*—Prof. Dawson is also an inconsistent writer. In 1869 he published his “Modern Ideas of Derivation,” an address to the students of McGill College, Montreal, in which he stated his belief, that Prof. Cope’s hypothesis, as advanced in his “Origin of Genera,” is the “most promising of all that have been announced,” and as “holding forth the most promising line of investigation by which we may hope ultimately to arrive at more true expression of the law of creation with reference to organized beings.” This was an admission that he was in accord with the evolutionists.

Prof. Dawson is among those who have attempted to harmonize Scripture and science. I am unable to see that they can at present be harmonized, and am confirmed in the belief in the difficulty, by the opinion of the ablest geologists with whom I have the good fortune to be acquainted. Moreover, Prof. LeConte, of the University of California, confirms this impression. He also has written and lectured largely upon this subject, for the benefit of the Young Men’s Christian Association, and is a firm believer in the truths of revealed religion. LeConte candidly admits that all attempts to reconcile the Mosaic cosmogony with the results of science must be distasteful to the philosophical Christian. They must ever be but artificial and ingenious human devices. Far better to regard the books of Revelation and of

nature in the philosophical spirit, and simply to wait and possess yourselves in patience, for the questions in dispute will, ere long, adjust themselves as others have done. He has used them, he admits, in times past, "but now considers them almost like trifling with the words of Scripture and the teachings of nature."<sup>1</sup>

"He who believes the Scriptures to have proceeded from Him who is the Author of nature, may well expect to find the same sort of difficulties in them as are found in the constitution of nature." This passage is from the writings of Origen, "the father of biblical criticism and exegesis in Christendom," and is probably the text upon which Bishop Butler based his "Analogy of Religion, Natural and Revealed, to the constitution and course of Nature," "the ablest treatise on the philosophy of religion."

Prof. Dawson admits that "organizations styling themselves 'the Church,' whose warrant from the Bible is often of the slenderest, have denounced and opposed new scientific truths and persecuted their upholders, but they have just as often denounced the Bible itself, and religious doctrines founded on it." He remarks that "theology is not religion, and may often have very little in common with true religion or with the Bible. When discussions arise between theology and other sciences, it is only a pity that either side should indulge in what has been termed the *odium theologicum*, but which is unfortunately not confined to *divines*." "Perhaps," he continues, "the most troublesome opposition to science, or rather to the progress of science, has sprung from the *tenacity with which we hold to old ideas*." The science, which was at one time the best attainable, roots itself in men's minds and thus "becomes a difficult matter to wrench from its hold, and its advocates are too apt to invoke in its defense political, social and ecclesiastical powers, and to support it by the authority of revelation, even when this, rightly understood, might be quite as favorable to the new views."

A work by Prof. Dawson entitled<sup>2</sup> "The Story of the Earth and Man," is, by many, esteemed a forcible protest against evolu-

<sup>1</sup> "Religion and Science; a series of Sunday lectures on the Relation of Natural and Revealed Religion, or the Truths revealed in Nature and Scripture." By Joseph LeConte, Prof. of Geology and Natural History in the University of California. 1874.

<sup>2</sup> "The Story of the Earth and Man." By J. W. Dawson, LL.D., F.R.S., F.G.S. Toronto and Montreal, 1873, p. 339, which has been severely criticised by Dr. Asa Gray in "Darwiniana," pp. 245-251

tion. In it he attempts to explain the facts of nature on the theory of creation as opposed to evolution, while he denounces the advocates of Darwinism, and boldly asserts "that evolution as an hypothesis has no basis in experience or in scientific fact." This work was written in 1873. He has so well described the character of the obstructionist and irreconcilable in the extracts above given from a more recent paper,<sup>1</sup> that we may almost imagine that he had himself in view, and that larger knowledge of the accumulating facts of evolution has had some influence upon his position as respects its scientific basis.

Prof. J. W. Dawson is, I believe, the only naturalist of deserved reputation who repudiates the established truths of evolution; yet he deems it his duty to apologize for the supposed "conflict of science and religion," and in the *Princeton Review* for November, 1879, appeared the following delivery from his pen. The pursuit of science has not entirely failed, even in his case, to widen his mental scope, and render him wiser than his theological proclivities would alone have left him:

"Perhaps there is no part of the Bible in which the teaching of nature with reference to divine things is more fully represented than in the Book of Job, and I am inclined to think that not a few, even of religious men, fail to see precisely the significance of the address of the Almighty to Job, in the concluding chapter of that book. Job is tortured and brought near to death by severe bodily disease. His friends have exhausted all their divinity and philosophy upon him in the vain effort to convince him that he deserves this infliction for special and aggravated sins; at length the Almighty intervenes and gives the final decision. But instead of discussing the ethical and theological difficulties of the case, He enters into a sublime and poetical description of nature. He speaks of the heaven above, of the atmosphere, its vapors, and its storms, and of the habits and powers of animals. In short Job is treated to a lecture on natural history, yet this instantaneously affects what the arguments of his friends have altogether failed to produce, and Job humbles himself before God in contrition and repentance. \* \* \*

"I would put this case of Job before modern Christians in three aspects: (1) Do we attach enough of importance to the Gospel of nature, as vindicating God's sovereignty and fatherhood, and preaching submission, humility and faith? Might we not here take a lesson from the Bible itself? (2) May there not be many in our time who like Job 'have heard of him with the hearing of

<sup>1</sup>"The So-called Conflict of Science and Religion." By Principal J. W. Dawson, of McGill University, in *The Science Monthly*, Vol x, pp. 72, 74.

the ear,' but have not seen him with the eye in his 'works,' and on the other hand, are there not many who have seen the works without seeing the Maker, who can even 'magnify God's works which men behold' without knowing the author of them? Would it not be well to bring more together in friendly discussion and comparison of notes, those who thus look on only one side of the shield? (3) Should we not beware of the error of Job's friends in misrepresenting God's plans and thereby denouncing those who differ from us? These three wise and well-meaning men had nature all around them, yet they disregarded its teachings, and dwelt on old saws and philosophic dogmas, until God himself had to bring out the whirlwind, the thunderstorm, the ostrich, the horse and the hippopotamus to teach a better theology." "What does this import? Simply that through the representation to him of God's works, Job had attained a new view of God and of himself. He had not considered or fairly viewed the world around him in its grandeur, its complexity, its unaccountable relations, and contrasted it with his own little sphere of thought and work."

So to the hitherto untaught, whether layman or divine, who, in ignorance of nature, have so generally "uttered what they understood not," "obscured counsel by words without knowledge," and have misrepresented God's plans, the philosophy of evolution will yet prove to be a revelation of the Divine wisdom.

*Adhesion of Dr. McCosh.*—The work of Dr. James McCosh, the distinguished professor of logic and mathematics of Queen's College, Belfast, on the "Divine Government, Physical and Moral," has been pronounced of preëminent merit, and even Dr. Charles Hodge, of Princeton, the accuser of Darwinism as rank atheism, asserts "it is generally regarded as one of the first books of the age." Dr. McCosh also wrote, in connection with Dr. Dickie, "Typical Forms and Special Ends in Creation," which is described as "in the modern phases of infidelity, as likely to prove more cogent than Butler and quite as unanswerable."

Dr. McCosh proved so powerful a champion against modern infidelity, so able a vindicator of the truths of revealed religion, that the College at Princeton, New Jersey, invited him to become its Principal. The directors were aware that there was no man among their divines of American theological training, competent to combat the "infidels" and do credit to their institution as a learned and accomplished president. Now what is the testimony of this distinguished teacher? It is that<sup>1</sup> "good may

<sup>1</sup>"Is the Development Hypothesis Sufficient?" by Dr. James McCosh in the *Popular Science Monthly*, Vol. x, pp. 86-100.

arise from showing that when the doctrine of development is properly explained and understood, and kept within its legitimate sphere, there is nothing in it inconsistent with natural or revealed religion." In his comments on Huxley's lectures he admits that<sup>1</sup> "transitional forms are ever casting up," and that "in certain fields we have these transitions already disclosed," that "certain cases indicate a tendency on the part of the reptile to rise to the bird, and of the bird to retain properties of the reptile. *I have ever stood up,*" says he, "*for a doctrine of development.*" "I see nothing irreligious in holding that the bird may have been evolved by numerous transitions from the reptile, and the living horse from the old horse of the Eocene formation." "Let us suppose they can also, in rare cases of combination, produce species, religion is not thereby undermined either in its evidences or in its essential doctrine." "God is present in all His works, and acts in all their actings." "For in Him we live and move and have our being." "For we are also His offspring." "This doctrine may be so stated as to make it pantheistic. It is the one grand truth contained in pantheism, giving it all its plausibility, and making it superior to that *bald theism which makes God create the world at first, and then stand by and see it go.*" "This doctrine can be so stated as to free it from all such tendencies on the one side or the other, so as to make God distinct from all His works and yet acting in them. This is, I believe, the philosophical doctrine. It has been held by the greatest thinkers which our world has produced, such as Descartes, Leibnitz, Berkeley, Herschel, Faraday and multitudes of others." In the view of the renowned Jonathan Edwards, "nature is a perpetual creation." Dr. McCosh continues: "God is to be seen not only in creation at first, but in the continuance of all things. He is acknowledged not only in the origination of matter, but in its development, not only in the reptile and the bird, but in the steps by which the one has been derived from the other; not only in the Orophippus, but in the stages by which that animal has risen into the horse so useful to man." "I do believe that these old horse forms were preparations for the horse now living." Finally, we conclude our numerous extracts from the writings of Dr. McCosh, with the following: "Suppose we admit all that Huxley claims on this subject, what then? Have we set aside any doctrine of philosophy or religion?

<sup>1</sup>"Is the Development Hypothesis Sufficient?" by Dr. James McCosh, in the *Popular Science Monthly*, Vol. x, pp. 86-100.

God is still to be seen every where in His works, and rules over all. It appears to me," he adds, "that the whole doctrine of vegetable and animal species needs to be reviewed and readjusted, and religion need not fear for the result. I have been convinced of this ever since I learned, when I was ardently studying botany, that the number of species of plants had risen to two millions. I was sure that all these are works of God, but I was not sure that each was a special creation."<sup>1</sup> Thus it appears that Dr. McCosh, one of the ablest defenders of the Christian faith against the attacks of modern infidelity, is a pronounced evolutionist!

*Adhesion of Rev. Charles Kingsley.*—If the above from the able and orthodox Dr. McCosh does not suffice to show that the whole line of argument used by some popular anti-evolution critics is fitted only to delude the unwary, I may adduce the testimony of Rev. Charles Kingsley in my defense.

This eloquent divine and naturalist, in his "Westminster Sermons,"<sup>2</sup> and in a paper afterwards read to a meeting of London clergy at Sion College, remarks, "The God who satisfies our conscience ought more or less to satisfy our reason also. To teach that, was Butler's mission [in his 'Analogy of Religion, Natural and Revealed'], and he fulfilled it well. But it is a mission which has to be refulfilled again and again, as human thought changes and human science develops. For if in any age or country the God who seems to be revealed by nature seems also different from the God who is revealed by the then popular religion, then that God and the religion which tells of that God, will gradually cease to be believed in." "For the demands of reason must be, and ought to be, satisfied. And, therefore, when a popular war arises between the reason of any generation and its theology, then it behooves the ministers of religion to inquire, with all humility and godly fear, on whose side lies the fault? Whether the theology which they expound is all that it should be, or whether the reason of those who impugn it is all that it should be?" Kingsley pronouncing it the duty of the naturalist to find out the *how* of things, and of the natural theologian to find out the *why*, continues:

"But if it be said, 'After all there is no why, the doctrine of

<sup>1</sup>"Is the Development Hypothesis Sufficient," by Dr. James McCosh. *The Popular Science Monthly*, Vol. x, pp. 86-100.

<sup>2</sup>Charles Kingsley's "Westminster Sermons," quoted in "Darwiniana," pp. 281, 282.

evolution by doing away with the theory of creation does away with that of final causes,' let us boldly answer, 'Not in the least.' We might accept all that Mr. Darwin, all that Prof. Huxley, &c., have written, and yet preserve our natural theology on the same basis as that on which Butler and Paley left it. That we should have to develop it I do not deny. Let us look rather with calmness and even with hope and good-will on these new theories; they surely mark a tendency towards a more or less scriptural view of nature. Of old it was said of Him without whom nothing is made, 'My Father worketh hitherto, and I work.' Shall we quarrel with science if she should show how these words are true? What, in one word, should we have to say but this, 'We know of old that God was so wise that He could make all things, but behold, He is so much more than even that, that he can make all things make themselves.'"

Kingsley was wise in his generation. He well knew that theologians had always been worsted in their conflicts with science, and he would ward off the injury to religion that invariably follows the defeat of her teachers. Moreover, his acquaintance with natural science gave him an extraordinary advantage over such divines as Dr. Hodge, Herbert Morris, *et id omne genus*. Kingsley knew the force of the position taken by Prof. White, of Cornell University, in his "Warfare of Science," and the truth of which he has incontestably proved in that excellent and pithy work; that "In all modern history, interference with science in the supposed interest of religion, no matter how conscientious such interference may have been, has resulted in the direst evils, both to religion and science, *invariably*. And on the other hand all untrammelled scientific investigation, no matter how dangerous to religion some of its stages may have seemed for the time to be, has *invariably* resulted in the highest good of religion and of science."

*Origin of Species*.—The opponents of evolution sometimes quote a passage from Huxley, as follows, it is "my clear conviction that *as the evidence now stands*, it is not absolutely proven that a group of animals having all the characteristics exhibited by a species in nature, has ever been originated by selection whether artificial or natural." ("Lay Sermons," p. 295.) They evidently forget Huxley's demonstration of the evolution of the horse. "This demonstration does not admit of a doubt," says an excellent authority. Dr. McCosh, as already quoted, says "I do fully believe that those old horse forms were preparations for the



horse now living.”<sup>1</sup> “The evidence is conclusive,” says Huxley, “as far as the fact of evolution is concerned, and if it can be proved, as the facts certainly do prove, that a complicated animal like the horse may have arisen by a gradual modification of a lower and less specialized form, there is surely no reason to think that any other animals have risen in a different way. The case is not isolated. Every new investigation into the Tertiary mammalian fauna brings fresh evidence tending to show how the rhinoceros, the pigs, the ruminants, have come about. Similar light is being thrown on the origin of Carnivora, and also in a less degree, on that of all the other groups of animals. \* \* The accurate information obtained in this department [that is regarding the origin of species], has put the *fact* of evolution beyond a doubt. Formerly the great reproach to the theory was, that no support was lent to it by the geological history of living things; now whatever happens, the fact remains that the *hypothesis is founded on the firm basis of palæontological evidence.*”—Huxley. Prof. Cope has shown us the origin of the camel by evolutionary processes with as much clearness and force as that of the horse has been demonstrated: Now the above has quite a different ring from Huxley’s early admission!

But says the uninformed and persistent doubter, “We know nothing of the method by which these four-toed horses became three-toed, or the three-toed passed into the two-toed, and finally into the one-toed, as we find them in our day. You have brought no evidence to show that they have had any genealogical relation. There is no evidence in modern time to show that any such changes have taken place.” Not so fast, my friend, we may reply. There is abundant evidence to show that changes are taking place of a very striking character, some of which are wonderfully pertinent to the case of the origin of the horse of our day. In the December number of the AMERICAN NATURALIST, p. 801, may be found the following, which should silence all discussion on this subject as final and conclusive.

Prof. Cope, when at the meeting of the California Academy of Sciences, Nov. 3, 1879, “Called attention to a pair of feet of a deer belonging to the academy, which were sent from Mendocino county, Cal. Each of these possessed but *one central toe* and

<sup>1</sup> Is the Development Hypothesis Sufficient? By Dr. James McCosh. In the *Popular Science Monthly*, Vol. x, pp. 86, 100.

*hoof*, instead of the usual *pair*. The speaker stated that the toes of the hinder feet were united throughout, and were so far developed beyond the usual point attained by the ordinary ruminant. The toes of the fore limb were different, *only one being continued to the hoof*, all the *others being rudimental*." The bones belonged to the modern deer and were not found fossilized.

But suppose the case rested on the evolution of the horse alone? When Newton demonstrated the law of gravitation from atoms to apples and falling towers, what did he do? He asserted *universal* gravitation! Men came to him with objections and difficulties, some trivial and some serious. He answered somewhat in this wise. "Gentlemen, some of your arguments are trivial, I would not answer them if I could; some are serious, just *now* I could not answer them if I would; nevertheless gravitation *is* and it is *universal*." All the objections to evolution may not be answerable at present, nevertheless the philosopher is justified in asserting that evolution *is* and that it *is universal*.

*Evolution a Grand Generalization.*—Some doubting critics esteems us "far too much inclined to accept as 'grand generalization' a bold and unproved theory and a theory which is hostile in its influences to the reception of the simple truths recorded for our profit in the Bible." What these simple truths may be they have not stated, and perhaps it were better they should refrain from the statement. I know of no more happy mode of turning the truths of evolution against the Bible, than that pursued by some perverse theologians of boldly asserting that they are antagonistic to the Scriptures. The truths of science, as we have seen in former discussions respecting geology, were regarded as antagonistic to the Bible, and anti-scientists were forced to admit the Bible in error or resort to the only avenue of escape, by considering it wrongly translated or improperly understood. Would it not be wise to admit this may again be the case, rather than provoke opposition and the damaging criticism of evolutionary science?

As respects the epithet "grand generalization," and the unproved character of the evolution doctrine, I have something more to say. Our critics have evidently not made themselves familiar with the profound philosophy of Herbert Spencer, who has based his wonderful works upon evolution, and is drawing therefrom his great system of scientific thought, the most original and most

important undertaking of the age. This system is solidly based upon the sciences of observation and induction, and is undoubtedly the largest scheme of systematic philosophy. Herbert Spencer is author of the only complete systematic statement of the doctrine of evolution. Now this Herbert Spencer is described by the most competent judges to be a thinker of larger calibre than has hitherto appeared in England, as keen an analyst as is known in the history of philosophy, not excepting Aristotle or Kant. In the highest realms of philosophical investigation he stands equal to all his predecessors, and has taken his position in the foremost rank of living thinkers. Now if a man of the character I have here outlined has taken evolution as a profound and all comprehensive generalization, we surely may be permitted to accept it as such. Let us not, my good critic, resemble the ostrich that hides her head in the sand and imagines that because she does not see, therefore neither can the world around see.

Our critics add that evolution is not proved. Do they suppose that such a host of men, eminent in science, besides the honored name above given, would stultify themselves by admitting its truth and proclaiming it to be an invaluable boon, had they not convinced themselves of its inherent worth by bringing to its investigation all the lights at their command? Let us see what kind of minds entertain a firm belief that evolution has been proved to be a true philosophy. "It is Mr. Darwin's misfortune to know more about the question he has taken up than any other man living," says the learned Huxley.

Sir Charles Lyell, after having for fifty years studied the subject of life in connection with the past changes of the globe, and embodied all the older views in all his numerous works, at length in the tenth edition of his "*Principles of Geology*," *abandoned the old ground as untenable*, and adopted the views presented by Darwin.

Dr. Asa Gray stated before the Association for the Advancement of Science, that he had repeatedly attempted to catch Darwin tripping, and had had referred to him many cases which he himself at the time considered opposed to the theory, but in every case had *been forced* to withdraw his objections. Thomas Meehan made the same remark. He had often supposed Darwin in error, but had *always found him right*.

Dr. Fritz Müller, an eminent German naturalist, says he took

no small pains to detect contradictions among the inferences as to the class of Crustacea to which he had devoted himself, and found none furnished by Darwin's theory.

Dr. Gegenbaur, author of "Outlines of Comparative Anatomy," which has been adopted as an authoritative text-book, has re-cast his work and embodied therein the Darwinian philosophy. He regards comparative anatomy as the *touchstone* of the truth of evolution.

Darwin's name is always mentioned among the German naturalists with the profoundest reverence. His theory is now the common starting point of German science in many departments of knowledge that would seem at first to be farthest from natural history. The recent selection of Darwin as an associate of the French Academy of Science, the very highest honor that contemporary wisdom can confer, mark emphatically the esteem with which he is regarded in France, long unwilling to admit the value of his labors.

Whether evolution is to be recognized is then no longer an open question. "It is enough that it is a mental view that answers to a great reality, and is undoubtedly the broadest principle of unification in nature the human mind has yet reached." As to whether it *is proved*, depends upon the individual temperament and capacity of him who examines it. To some minds there exists no possibility of proving the truth or falsehood of any moral questions or of any physical problems, unless they can be brought to the test of mathematics. Minds of this character should confine themselves to their proper sphere, they are beyond instruction and are incorrigible. Evolution has been proved, as have many other problems in physical and natural science; the ablest experts are perfectly satisfied, why should the popular mind withhold its assent? "I do not think that I am speaking too strongly when I say that there is now scarcely a single competent general naturalist who is not prepared to accept some form of the doctrine of evolution," says Prof. C. Wyville Thomson in his Introduction to "The Depths of the Sea," an account of the general results of the dredging cruise of the *Porcupine* and *Lightning*, 1868, 1869 and 1870, p. 9.

It may interest our readers to know to what extent the doctrines of evolution are taught in our higher institutions of learning. At Harvard every professor whose departments are connected with

biology, such as Gray, Whitney, A. Agassiz, Hagen, Goodale, Shaller, James, Farlow and Faxon, is an evolutionist, and man's physical structure they regard as no real exception to the law. They are all said to be theists and all conservative men. At Johns Hopkins University, Baltimore, which aims to be the most advanced in the country, evolution is held and taught. In the University of Pennsylvania all the biological professors are evolutionists, Leidy, Allen, Rothrock and Parker. At Yale, Michigan University, Brown, Cornell, Dartmouth, Bowdoin, Princeton, the biological professors are all in the same category. There can scarcely an exception be found. Wherever there is a working naturalist he is sure to be, almost without an exception, an evolutionist. Prof. James D. Dana often adduced as an opponent, in his new "Text Book of Geology," p. 341, says: "Its progress [the system of nature] if by divine power should be, as zoölogical history attests, a development, an unfolding, an evolution." "We challenge," says an ex-president of the American association for the advancement of Science, "to find three working naturalists of repute in the United States—or two (we can find one in Canada)—that is not an evolutionist. I should regard a teacher of science who denied the truth of evolution as being as incompetent as one who doubted the Copernican theory." (*Popular Science Monthly*, Vol. xvi, pp. 558-559.) "It is now regarded, among the active workers in science, as a waste of time to discuss the truth of evolution. The battle on this point has been fought and won."

*Evolution demonstrated by the Changes going on around us.*—Those of our critical friends to whom evolution is not to their understandings established on a basis of demonstration, I would refer to a very instructive paper republished in the supplement to the *Popular Science Monthly*, Vol. xv, entitled "Animals and their Environments." They will there find indubitable proof that certain animals were not originally created as they now exist, and that their surroundings have greatly modified their forms, and the doctrine of special creation demolished. Among others, the changes that take place in the flounder and other flat fishes are described, and the manner in which these fishes, originally formed symmetrically like others of their congeners, with eyes on both sides of their heads, swimming upright, and colored on the back and white on their under side, become, through want of a swimming bladder to preserve them in an upright position obliged

to turn upon their sides and to descend to the bottom of the water. Here they undergo a metamorphosis, which is a wonderful instance of the manner in which nature modifies animals and adapts them to new conditions. The flounder thus placed at the mercy of its environment, begins to change color on the under side which becomes whiter from the absence of light, while the upper side becomes darker from its continuous action. The eyes were originally on opposite sides of the head, as in normal fishes, but the eye which was created upon the side which is now undermost, gradually moves around and takes its place upon the upper side, thus presenting the appearance, familiar to any one who has seen the turbot or flounder, of an animal with both eyes on the same side of its head.

They will there find, also, a notice of the transformation of the North American axolotl (Siredon) into a completely different animal, with which it was not known to have near relationship, and already placed in a different genus. They will also see an explanation of the manner in which the Alpine salamander has probably changed from an egg-bearing to an ovo-viviparous animal in places too dry for the production of animals having gills in their earlier stages, by causing the eggs to hatch within the mother, and the young to pass their gill stage within the fluids of her body instead of in water, as do the young of other newts or salamanders.

There is an excellent lesson in evolution to be found in the history of the Sacculina, which is a parasite upon the hermit crab. This illustrates the manner in which *degradation* is brought about, for this is often as striking a process of evolution as is *advancement* to higher forms. This Sacculina, as it is found on hermit crabs, is a sort of cylindrical mass with a bundle of roots growing from one side; sense it has none, limbs none, organs none, and hardly the vestige of organs and only the faintest traces of mouth and intestines. It is an embryo but not far enough advanced to show what it is to be. Listen to its history. This structureless lump began life as a little barnacle crab, swimming in the ocean, having a symmetrical body, three pairs of legs and one eye, and bearing a close resemblance to the embryos of all crabs in this state, which is called the "nauplius stage," or that first to develop out of the egg. Very soon our nauplius barnacle leaves off roving and attaches himself to the soft hind parts of a

relative, the hermit crab, and begins to suck the juices of his host. He soon loses his eye, then his limbs, then the segmentation of his body, then his head, his intestines, his everything that seems to constitute him an animal. He grows too lazy and sinks too low even to eat. Around his mouth develop a bundle of roots which spread through the soft body of the hermit crab as roots of a plant through the ground, and he sinks to the level of a mere automatic existence. Now his host, the hermit crab, and this degraded *Sacculina* started alike, and in the long ages, before the hermit had come to be what he is, the common ancestor of all crabs, wore, in maturity, the form of this parasite in its nauplius stage. Parasitism has pulled the *Sacculina* down to utter debasement, as it has all other parasites whether in man or animals. Thus creation advances and recedes, and numberless instances of both processes could be found in nature, for description of some of which I would refer to "Life History of our Planet," by Wm. D. Gunning, and "The History of Creation," by Ernst Haeckel.

The above instances of actual transformation among hundreds that could be adduced, the result of their surroundings, changes brought about by changed conditions, must give our critics reason to pause before they again attempt to deny that Darwinism can bring to its defence the "hard logic of facts" and sound induction.

We have occasionally heard the remark, that it is degrading to the self-respect of man to consider himself descended from a long line of animals, beginning with the polyp or ascidian. Let us consider that in evolution we have no *new truth*, but an old truth in a new form, the evolution of the individual by a slow process from a microscopic germ. Everybody knows that this is the process of development through which every one of us has passed. Yet it has never interfered with our belief in an intelligent Creator. When asked who made us, we say "God made us." But how were we made? The only true answer must be, by a process of evolution, a slow process of evolution from a microscopic sphere of unorganized protoplasm, the germ cell. This knowledge does not lessen our respect for the dignity of man, why then should it be different in the case of the origin of our species and of all species by evolution.<sup>1</sup>

<sup>1</sup> The earnest reader who desires to become acquainted with the most advanced views of students of biology, and the recent demonstrations of the stages through

*The Struggle for the Liberty of Science.*—To those who are acquainted with the history of physical discovery, and the great struggle for the liberty of science, the conflict waged with evolution by theological error seems but a continuation of the struggle that has lasted for so many centuries. "Unfortunately, some good men started, centuries ago, with the idea that purely scientific investigation is unsafe, that theology must intervene, and thus began this great war." Among the leading innovations advanced by science, there are few indeed that have not been opposed by theologians. The idea that the earth is a globe was pronounced fraught with danger to Scripture—that is the *popular interpretation*—and the great majority of the fathers of the church denied that a man could be saved who believed the earth to be round and inhabited on its opposite sides! It was not until Magalhaens sailed around the earth, that theologians subsided. The Copernican theory of the heavens, now universally accepted, was solemnly condemned, and to read the book of Copernicus was to risk damnation. H. Bruno was hunted from land to land and finally burned alive because of its advocacy. It was not established until the telescope of Galileo confirmed its truth, and even then, many either declared it impious to look into the telescope of Galileo, or if they saw the satellites of Jupiter, denounced them as delusions of the devil! The story of the unfortunate Galileo, and his sorry recantation of the truth, is known to all intelligent readers.

"There has been raised the same cry in all ages—the same we hear in this age—for curbing scientific studies." The anatomist Vesalius was hunted to death because he dissected the human body. Theology denounced in sermons "the dangerous and sinful practice of inoculation" for the small-pox, and Jenner's vaccination was declared as "bidding Heaven defiance." Even the use of chloroform in our own day, for theologians have not learned wisdom, was, from the pulpit, declared "contrary to Holy Writ!"

which the genesis of man has been effected, should consult a series of papers published in the *Penn Monthly* for April, May and June, 1877, and since re-published by E. Stern & Co., 125 and 127 N. Seventh street, Philadelphia. These papers, by L. A. Ward, A.M., are entitled "Haeckel's Genesis of Man; a History of the Development of the Human Race," being a review of his *Anthropogenie*, embracing a summary and exposition of his views and of those of the advanced German school of science, and since translated into English and published, and entitled "The Evolution of Man," by that vigorous expositor of this doctrine. New York, 1879.



It is difficult to realize that within our own memory a similar battle raged between the advocates of what was called the "sacred theory of the earth" and the views of geologists, and that anathema, styled arguments, were used in the nineteenth century similar to those hurled at science in the middle ages. In our own day geology has been declared "not a subject of lawful inquiry," and denounced as a "dark art, dangerous and disreputable," as "infernal artillery," and as "an awful evasion of the testimony of revelation."<sup>1</sup>

There have been many other battle fields, equally instructive, in which theologians have opposed the progress of the age and blindly fought against the good of mankind. Fanning mills were at one time denounced as contrary to the text, "the wind bloweth where it listeth" and as leaguings with Satan, who is "the prince of the powers of the air," and as sufficient cause for excommunication from the Scotch church.<sup>2</sup> The railroad and the telegraph have been denounced from a noted pulpit as "heralds of Anti-Christ!!"

But perhaps the most ridiculous proposal to prove that "it is supreme folly to talk of accommodating Christianity to Darwinism," is that announced in the *Church Journal*, by a reviewer of Dr. Hodge's book against Darwinism, which is as follows: "If we have all, men and monkeys, women and baboons, oysters and eagles, all 'developed' from an original monad and germ, then St. Paul's grand deliverance, 'All flesh is not the same flesh. There is one kind of flesh of men, another of beasts, another of fishes and another of birds; there are bodies celestial and bodies terrestrial'—may be still very grand in our funeral service but very untrue to fact." Oh sad! sad! that any man supposed to be sane could give forth such an utterance as argument! What good can possibly result to mankind from the opposition of ignorant men who stand upon high places "screaming in wrath at the advance of science." In every case this ecclesiastical war, during its continuance, has tended to drive multitudes of thoughtful men away from religion, and theologians have to answer for this result.

In all this long warfare the victory has invariably been with science, and "the whole civilized world now declares that it was

<sup>1</sup> See "Geology and Scripture," by Pye Smith, D.D., pp. 156, 157, 168, 169.

<sup>2</sup> "Burtens' History of Scotland," Vol. VIII, p. 511.

won for religion—that thereby was infinitely increased the knowledge of the power and goodness of God.” “Let then the warfare of science be changed,” says Prof. A. D. White, from whom we have derived several of our illustrations. “Let it be a warfare in which religion and science shall stand together as allies. Let the fight be for truth of every kind, against falsehood of every kind, for the living kernel of religion rather than the dead husks of sect and dogma, and the great powers whose warfare has brought so many sufferings, shall at last join in ministering through earth, God’s richest blessings.”<sup>1</sup>

*Conclusion.*—Want of a scientific habit of mind is the source of much of the prevalent misconception as to what constitutes adequate proof in natural science.

In order to understand the doctrine of descent, or the theory of evolution, it is indispensable that the inquirer possess a general knowledge of biological phenomena. It must be evident that a certain degree of general culture, and especially a philosophical education, is requisite to enable one to comprehend the individual and palæontological history of development. This preparation unfortunately many persons in our day do not consider at all necessary. “One hears hundreds of half educated persons pass a final judgment upon it, although they acknowledge that they know nothing either of botany or of zoölogy, of comparative anatomy, of palæontology or of embryology.” Hence it happens, as Huxley well says, that “most writings published against Darwin are not worth the paper upon which they are written.”—Quoted by Haeckel in his “History of Creation,” Vol. II, p. 346.

Among many recent opinions expressive of approval of the doctrines of evolution, the following may properly conclude this article.

Prof. Stanley Jevons, one of the clearest thinkers of our day, and the master spirit who has proved that John Stuart Mill’s great work on “Logic” is essentially illogical, admits that Herbert Spencer has made a new epoch in philosophic thought. When speaking of Spencer’s “Data of Ethics,” which is the culmination of his philosophy, Prof. Jevons asserts that “Spencer has pointed out that the universe is one deep-laid framework for

<sup>1</sup>“The Warfare of Science,” by Andrew Dickson White, LL.D, President of Cornell University. N. Y., Appleton & Co., 1877. Pages 150, 151.

the production of beneficent contrivances," and that it "is a deep-built scheme working towards goodness and happiness." "Spencer calls upon us to admit the inventing machine of evolution, a 'machine' which is the most comprehensive of all machines, because it is ever engaged in inventing beneficial inventions *ad infinitum*." "We must accept the philosophy," says Jevons, "if it be true, and for my part I do so without reluctance." "According to Spencer," continues this admirable critic, "we are the latest manifestation of an all-prevailing tendency towards the good, the happy, and that we are no lump of protoplasm but the creature of a Creator."—*Contemporary Review*, Nov., 1879. Let it be remembered that as the sagacious Dr. McCosh expresses it, "Herbert Spencer is to a large extent the author and is certainly the organizer and the embodiment, personification and expression of development."—*Princeton Review*. "Theologians have ever been free in the application of damnatory expletives to scientific ideas which do not conform to their standard," but it is very pleasant to turn from denunciation and anathema to the language of *The Nonconformist* of November 5th, a journal of the English orthodox dissenters, and there read the following opinion of Spencer's "Data of Ethics," his last production, and the culmination of his system of philosophy. Speaking of the glimpses it affords into the future which its author anticipates, *The Nonconformist* remarks, "No loftier view, we venture to say, was ever entertained." "The optimism of Mr. Herbert Spencer is as pure as that of the most spiritual seers of the past, and it involves as radical a change in human nature as that demanded by the New Testament. It is, in his own words, 'a rationalized version of its ethical principles.' The fact that they are Christian in their essence is rather a hindrance to their acceptance, since conventional Christianity practically repudiates the ideal morality of its founder."

We never expected to live to see the name of Herbert Spencer, the embodiment, personification and expression of development "received with applause in a great religious convention of orthodox people, but if the report of the London *Times* of October 10th can be trusted, this extraordinary phenomenon has actually occurred! In that convention the Rev. Prof. Pritchard gave an eloquent and powerful address on "The Religious Benefits from Recent Scientific Research," in which the doctrine of evolution

was assumed as true, and as in entire harmony with all essential religious truth. He was followed by the Rev. Prof. Watkins, of St. Augustine College, Canterbury, who spoke on the same subject, and said "he felt sure that when the history of the century came to be written from the standpoint of the future, the name of Herbert Spencer would be found in the very first rank of English thinkers." "These expressions indicate a very marked progress in religious liberality," says the editor of the *Popular Science Review* of January, 1880.

Prof. James D. Dana in his new "Text Book of Geology," p. 346, expresses his opinion on this wise: "That the system of life exhibits so perfect harmony and so complete oneness of law in its several lines and successions, that it may be truly called a system of development or evolution, whatever the method by which it was carried forward," and that, "It is also certain that science, whatever it may accomplish in the discovery of causes or methods of progress, can take no steps toward setting aside a Creator. Far from such a result, it clearly proves that there has been not only an omnipotent hand to create and to sustain physical forces in action, but an all-wise and beneficent Spirit to shape all events towards a spiritual end."—*Ibid.*, p. 351.

Thus it is easily shown that the opinions of men disqualified by age or a conservative spirit, interested prejudice or enfeebled faculties, should not be regarded when opposed to new doctrines in science; that those who have devoted themselves to science have, whenever free from the prejudices of education, heartily embraced the new views; and finally that even those who have been regarded as the ablest defenders of the truths of revelation when enlightened by acquaintance with science and penetrated by its spirit, become generous defenders and fearless advocates of evolution and absolve it from all charges of atheism and want of scientific basis.